

REMARKS

RESTRICTION

The Office required restriction to:

- I. Claims 1-6, drawn to a micropyrolyzer, or
- II. Claims 7-20, drawn to a method for pyrolyzing a sample for analysis, or
- III. Claims 21-33, drawn to an analyzer

Applicants elect Group II, claims 7-20, drawn to a method for pyrolyzing a sample for analysis, without traverse.

STATUS OF THE CLAIMS

Claims 7-20 and Claims 34-38 remain in the application.

The Office rejected claims 7, 8, 10-13, and 20 under 35 U.S.C. 102(b) as being anticipated by *Meuzelaar*.

The Office rejected claims 7, 9, 15, and 20 under 35 U.S.C. 102(b) as being anticipated by *Wohltjen*.

The Office rejected claims 7, 8, and 14-19 under 35 U.S.C. 103(a) as being unpatentable over *Bertrand* in view of Applicants' admitted prior art.

SUMMARY OF THE INVENTION

The present invention is directed a method fro vaporizing a liquid or solid sample using a micropyrolyzer comprising a substrate having a suspended membrane formed thereon and a resistive heating element disposed on the membrane for heating the sample. The sample size can be less than 3 microliters and the heating rate can be up to 70°C per millisecond with very low power consumption.

SUMMARY OF THE ART

Meuzelaar, U.S. 4,408,125, discloses a modular pyrolysis inlet apparatus and method for pyrolyzing compounds. The pyrolysis inlet includes an insertion probe having a ferromagnetic wire bearing the sample to be analyzed. The sample-containing ferromagnetic wire can be heated by a high frequency induction coil to its Curie-point

temperatures of 359 – 1128°C in 100 milliseconds to about six seconds to pyrolyze the sample.

Wohljen et al., U.S. 5,550,062, discloses a pyrolysis chamber comprising a trap (e.g., glass wool) for collecting a sample (e.g., dust and/or aerosol particles) that can be vaporized upon heating the trapped sample to a predetermined temperature (e.g., 300°C) with a resistive heater.

Bertrand et al., U.S. 6,627,881, discloses a method for analyzing microorganisms and other high-molecular weight species using a commercially available pyrolyzer.

ARGUMENTS

AMENDED CLAIMS 7, 8, 10-13, AND 20, LIMITED TO HEATING THE SAMPLE ON A MEMBRANE WITH A RESISTIVE HEATING ELEMENT OF A MICROPYROLYZER, ARE NOT ANTICIPATED BY *Meuzelaar* UNDER 35 U.S.C. § 102(b)

The Office rejected Claims 7, 8, 10-13, and 20, asserting that the Applicants' method for vaporizing a liquid or solid sample is anticipated by *Meuzelaar's* method for pyrolyzing a sample. To anticipate a claim, the reference must teach each and every element of the claim. *See* MPEP 2131. Applicants submit that *Meuzelaar* does not anticipate amended Claims 7 and 8, and Claims 10-13 and 20, because *Meuzelaar* does not teach a method for vaporizing a sample using a micropyrolyzer.

Meuzelaar teaches a method for pyrolyzing a sample using a sample-containing ferromagnetic wire that is heated with a high-frequency induction coil. A conventional, Curie-point pyrolyzer, such as *Meuzelaar's* requires a large power supply and control unit, and costly equipment. *See* Application, page 4, lines 6-13. Furthermore, at best, *Meuzelaar's* pyrolyzer can achieve a heating rate of only 1128°C / 100 milliseconds = 11°C per millisecond. *See Meuzelaar*, col. 6, lines 30-31; and col. 10, lines 4-8.

Applicants have amended Claim 7 to recite heating the sample on a suspended membrane with a resistive heating element disposed on the membrane of a micropyrolyzer.

Applicants have amended Claim 8 to be consistent with the amended to Claim 7. Support for these amendments is found throughout the Application, and particularly at page 7, lines 1-18. Applicants' micropyrolyzer has a small overall size, low power consumption,

and very fast heating rate, enabling a field portable analyzer. *See* Application, page 4, lines 14-27; page 7, lines 17-18; page 10, lines 2-11; and page 11, lines 1-8. Due to the thermal isolation and low heat capacity of the suspended membrane, Applicants' micropyrolyzer can achieve heating rates of 70°C per millisecond. *See* Application, page 11, lines 2-5; and Claims 10-12.

Meuzelaar does not teach or suggest a method for vaporizing a sample using a micropyrolyzer. Conversely, Applicants teach, and amended Claim 7 recites, a method for vaporizing a sample by heating the sample on a membrane with a resistive heating element of a micropyrolyzer. Accordingly, Applicants submit that this rejection is overcome and that Claim 7 is now in condition for allowance. Furthermore, Applicants submit that Claims 8, 10-13, and 20, which depend from and further define Claim 7, are likewise in condition for allowance. *See* MPEP 2143.03.

AMENDED CLAIMS 7, 9, 15, AND 20, LIMITED TO HEATING THE SAMPLE ON A MEMBRANE WITH A RESISTIVE HEATING ELEMENT OF A MICROPYROLYZER, ARE NOT UNPATENTABLE OVER *WOHLTJEN* UNDER 35 U.S.C. § 103(a)

The Office rejected Claims 7, 9, 15, and 20, asserting that the Applicants' method for vaporizing a liquid or solid sample is anticipated by *Wohltjen*'s method of chemical detection by pyrolysis. To anticipate a claim, the reference must teach each and every element of the claim. *See* MPEP 2131. Applicants submit that *Wohltjen* does not anticipate amended Claim 7, and Claims 9, 15, and 20, because *Wohltjen* does not teach a method for vaporizing a sample using a micropyrolyzer.

Wohltjen teaches a method for collecting a sample on a trap and heating the trapped sample with a resistive heater. *Wohltjen*'s collecting trap (e.g., a bed of glass wool) is necessarily bulky, can only be heated to relatively low temperatures (e.g., 300°C), and the heating rate is very slow (e.g., 230°C per 10 minutes). *See Wohltjen*, col. 5, lines 13-50; col. 12, lines 6-20. Furthermore, *Wohltjen* discloses solid sample sizes of 50-200 micrograms (the sample concentrations in Tables 1 and 2 refer to vapor concentrations). *See Wohltjen*, col. 12, lines 6-7; and col. 14, lines 6-7.

As described, *supra*, Applicants have amended Claim 7 to recite heating the sample on a suspended membrane with a resistive heating element disposed on a membrane of a micropyrolyzer. Applicants' micropyrolyzer has a small overall size, low power consumption, and a very fast heating rate, enabling a field portable analyzer. For example, Applicants' micropyrolyzer can accept samples of less than 3 microliters. *See* Application, Claim 9.

Wohltjen does not teach or suggest a method for vaporizing a sample using a micropyrolyzer. Conversely, Applicants teach, and amended Claim 7 recites, a method for vaporizing a sample by heating the sample on a membrane with a resistive heating element of a micropyrolyzer. Accordingly, Applicants submit that this rejection is overcome and that Claim 7 is now in condition for allowance. Furthermore, Applicants submit that Claims 9, 15, and 20, which depend from and further define Claim 7, are likewise in condition for allowance. *See* MPEP 2143.03.

AMENDED CLAIMS 7, 8, AND 14-19, LIMITED TO HEATING THE SAMPLE ON A MEMBRANE WITH A RESISTIVE HEATING ELEMENT OF A MICROPYROLYZER, ARE NOT UNPATENTABLE OVER *BERTRAND* UNDER 35 U.S.C. § 103(a)

The Office rejected Claims 7, 8, and 14-19, asserting that the Applicants' method for vaporizing a liquid or solid sample is made obvious by *Bertrand's* method of detection and identification of microorganisms. To establish a *prima facie* case of obviousness, *inter alia*, the prior art references must teach or suggest all of the claim limitations. *See* MPEP 2143. Applicants submit that amended Claims 7 and 8, and Claims 14-19, are not obvious, because *Bertrand* does not teach or suggest a method for vaporizing a sample using a micropyrolyzer.

Bertrand teaches a method for analyzing a sample using a commercially available pyrolyzer. As argued, *supra*, Applicants have amended Claim 7 to recite heating the sample on a suspended membrane with a resistive heating element disposed on the membrane of a micropyrolyzer. Unlike the commercially available pyrolyzers, Applicants' micropyrolyzer has a small overall size, low power consumption, and very fast heating rate, enabling a field portable analyzer.

Bertrand does not teach or suggest a method for vaporizing a sample using a micropyrolyzer. Conversely, Applicants teach, and amended Claim 7 recites, a method for vaporizing a sample by heating the sample on the membrane with the resistive heating element of a micropyrolyzer. Accordingly, Applicants submit that this rejection is overcome and that Claim 7 is now in condition for allowance. Furthermore, Applicants submit that Claims 8, and 14-19, which depend from and further define Claim 7, are likewise in condition for allowance. *See* MPEP 2143.03.

Furthermore, to be a proper §103 reference, the reference must be prior art reference under §102. A U.S. patent issued from a U.S. application becomes prior art effective on its filing date under §102(e). Therefore, *Bertrand* is a prior art reference under §102(e) (and, therefore, §103) effective on Nov. 28, 2000. Applicants submit that their invention was completed by and presented at the session on Advanced Environmental and Chemical Sensing Technology at Photonics East, held Nov. 5-8, 2000 in Boston, Massachusetts. *See* Morgan *et al.*, “Rapid Identification of bacteria with miniaturized pyrolysis/GC analysis,” Proc. SPIE 4205, 199 (2001). Therefore, completion of Applicants’ invention occurred prior to the filing date of *Bertrand*. Accordingly, Applicants submit that *Bertrand* is not a proper §103 reference, as asserted by the Office.

NEW CLAIMS 34-38

Applicants have added new claims 34-38 to further define the micropyrolyzer of Claim 7. Support for these new claims is found throughout the Application, and particularly in withdrawn Claims 2-6.

CONCLUSION

Applicants have amended the Claims and urge that the application is now in condition for allowance.

Respectfully submitted,



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CERTIFICATION UNDER 37 CFR 1.8

I hereby certify that this correspondence and documents referred to herein were deposited with the United States Postal Service as first class mail addressed to: Commissioner for Patents, Alexandria, VA 22313-1450 on the date shown below.

Date: 1/30/04

By: Martha Injillo